

Please amend the present application as follows:

Claims

The following is a copy of Applicant's claims that identifies language being added with underlining ("____") and language being deleted with strikethrough ("~~————~~") or brackets ("[[]]"), as is applicable:

1. (Currently amended) A method for inspecting a press-fit connection, the method comprising:

capturing an image of a circuit board location at which a pin is to have been press-fit;

identifying a feature in a captured image that may comprise a tip of the pin;

measuring characteristics ~~that pertain to~~ of particular features ~~of~~ on the identified pin tip;

comparing the measured characteristics with at least one of stored reference values and each other; and

making a final decision as to whether the press-fit connection is acceptable based upon results of the comparing.

2. (Original) The method of claim 1, wherein capturing an image comprises capturing an image of a flat end surface of the pin tip and separately capturing an image of at least one chamfered surface of the pin tip.

3. (Original) The method of claim 2, further comprising forming a composite image that comprises data from the captured image of the flat end surface and the captured image of the at least one chamfered surface.

4. (Original) The method of claim 2, wherein capturing an image of the flat end surface comprises illuminating the pin with light that is emitted nearly perpendicular to the circuit board and capturing an image of the at least one chamfered surface comprises illuminating the pin with light that is emitted nearly parallel to the circuit board.

5. (Original) The method of claim 4, wherein illuminating the pin with light that is emitted nearly perpendicular comprises emitting light at an angle of approximately 70 degrees away from a plane that is parallel with a plane of the circuit board.

6. (Original) The method of claim 4, wherein illuminating the pin with light that is emitted nearly parallel comprises emitting light at an angle of approximately 15 degrees away from a plane that is parallel with a plane of the circuit board.

7. (Original) The method of claim 1, wherein identifying a feature in a captured image comprises performing correlation pattern matching to identify a match in the captured image with a pin tip model.

8. (Original) The method of claim 1, wherein measuring characteristics comprises defining an image analysis line that crosses the pin tip and measuring pixel intensity along the length of the defined line.

9. (Original) The method of claim 1, wherein measuring characteristics comprises measuring a dimension of at least one of a flat end surface and a chamfered surface of the pin tip.

10. (Original) The method of claim 1, wherein measuring characteristics comprises measuring a peak pixel intensity of at least one of a flat end surface and a chamfered surface of the pin tip.

11. (Original) The method of claim 1, wherein measuring characteristics comprises measuring a position at which a peak pixel intensity occurs for at least one of a flat end surface and a chamfered surface of the pin tip.

12. (Original) The method of claim 1, wherein comparing the measured characteristics comprises comparing a dimension of at least one of a flat end surface and a chamfered surface of the pin tip with a reference value.

13. (Original) The method of claim 1, wherein comparing the measured characteristics comprises comparing a peak pixel intensity of at least one of a flat end surface and a chamfered surface of the pin tip with a reference value.

14. (Original) The method of claim 1, wherein comparing the measured characteristics comprises comparing a position of a peak pixel intensity of a chamfered surface of the pin tip with a position of a peak pixel intensity of a flat end surface of the pin tip.

15. (Original) The method of claim 1, wherein making a final decision comprises weighting the results so that the results that are most highly indicative of whether the press-fit connection is or is not acceptable is given greater weight than other results.

16. (Currently amended) A system for inspecting a press-fit connection, the system comprising:

means for illuminating a pin tip from two distinct directions, a first direction suited to illuminate a flat end surface of the pin tip and a second direction suited to illuminate at least one chamfered surface of the pin tip;

means for capturing a first image while the pin tip is illuminated with light from the first direction and a second image while the pin is illuminated with light from the second direction;

means for measuring characteristics from image data of the captured images ~~that pertain to~~ of a flat end surface and at least one chamfered surface of the pin tip; and

means for comparing the measured characteristics with at least one of stored reference values and each other.

17. (Original) The system of claim 16, wherein the means for illuminating comprise a lighting head that is adapted to emit light in a direction nearly perpendicular to a plane of a circuit board in which the pin is inserted and a direction nearly parallel to the plane of the circuit board.

18. (Original) The system of claim 16, wherein the means for capturing comprise a two-dimensional camera.

19. (Original) The system of claim 16, wherein the means for measuring comprise an image analysis system that is configured to define an image analysis line that crosses the pin tip and that measures pixel intensity along the length of the defined line.

20. (Original) The system of claim 19, wherein the image analysis system is configured to measure a dimension of at least one of the flat end surface and the at least one chamfered surface.

21. (Original) The system of claim 16, wherein the means for comparing comprise an image analysis system that is configured to compare a dimension of at least one of the flat end surface and the at least one chamfered surface with a reference value.

22. (Original) The system of claim 16, wherein the means for comparing comprise an image analysis system that is configured to compare a peak pixel intensity of at least one of the flat end surface and the chamfered surface with a reference value.

23. (Original) The system of claim 16, wherein the means for comparing comprise an image analysis system that is configured to compare a position of a peak pixel intensity of a chamfered surface with a position of a peak pixel intensity of the flat end surface.

24. (Currently amended) The system of claim 16, further comprising means for identifying the pin tip in ~~the~~ a composite image formed from the first and second images.

25. (Original) The system of claim 16, further comprising means for making a final decision as to whether the press-fit connection is acceptable based upon results obtained by comparing the measured characteristics with at least one of stored reference values and each other.

26. (Currently amended) ~~An inspection system stored on a~~ A computer-readable ~~medium, the~~ memory that stores an inspection system comprising:

logic configured to identify a tip of a pin that has been press fit into a circuit board;

logic configured to measure characteristics ~~that pertain to~~ of a flat end surface and a chamfered surface of an identified pin tip;

logic configured to compare measured characteristics with at least one of stored reference values and each other; and

logic configured to make a final decision as to whether the pin is properly installed based upon results of the comparing performed by the logic configured to compare.

27. (Currently amended) The ~~system~~ computer-readable memory of claim 26, wherein the logic configured to identify a tip of a pin comprises logic configured to perform correlation pattern matching to identify a match in the image with a pin tip model.

28. (Currently amended) The ~~system~~ computer-readable memory of claim 26, wherein the logic configured to measure characteristics comprises logic configured to define an image analysis line that crosses the pin tip and to measure pixel intensity along the length of the defined line.

29. (Currently amended) The ~~system~~ computer-readable memory of claim 26, wherein the logic configured to measure characteristics comprises logic configured to measure dimensions of the flat end surface and the chamfered surface.

30. (Currently amended) The ~~system~~ computer-readable memory of claim 26, wherein the logic configured to measure characteristics comprises logic configured to measure peak pixel intensities of the flat end surface and the chamfered surface.

31. (Currently amended) The ~~system~~ computer-readable memory of claim 26, wherein the logic configured to measure characteristics comprises logic configured to measure positions at which a peak pixel intensities occur for the flat end surface and the chamfered surface.

32. (Currently amended) The ~~system~~ computer-readable memory of claim 26, wherein the logic configured to compare measured characteristics comprises logic configured to compare dimensions of the flat end surface and the chamfered surface with reference values.

33. (Currently amended) The ~~system~~ computer-readable memory of claim 26, wherein the logic configured to compare measured characteristics comprises logic configured to compare peak pixel intensities of the flat end surface and the chamfered surface with reference values.

34. (Currently amended) The system computer-readable memory of claim 26, wherein the logic configured to compare the measured characteristics comprises logic configured to compare a position of a peak pixel intensity of the flat end surface with a position of a peak pixel intensity of the chamfered surface.

35. (Currently amended) The system computer-readable memory of claim 26, wherein the logic configured to make a final decision comprises logic configured to weigh comparison results so that the results that are most highly indicative of whether the pin is or is not properly installed is given greater weight than other results.

36. (Currently amended) A system for inspecting a press-fit connection, the system comprising:

a camera adapted to capture images of a circuit board to be inspected;

a lighting head that is adapted to emit light in a direction nearly perpendicular to the circuit board and in a direction nearly parallel to the circuit board; and

an image analysis system configured to identify a tip of a pin that has been press fit into the circuit board, to measure characteristics ~~that pertain to~~ of a flat end surface and of a chamfered surface ~~of~~ on the identified pin tip, to compare the measured characteristics with at least one of stored reference values and each other, and to make a final decision as to whether the pin is properly installed based upon results of the comparing.

37. (Original) The system of claim 36, wherein the camera is a charge-coupled device.

38. (Original) The system of claim 36, wherein the lighting head emits light at an angle of approximately 70 degrees relative to a plane parallel to a plane of the circuit board and an angle of approximately 15 degrees relative to another plan parallel to the plane of the circuit board.

39. (Original) The system of claim 36, wherein the image analysis system is configured to measure at least one of dimensions of the flat end surface and the chamfered surface, peak pixel intensities of the flat end surface and the chamfered surface, and positions at which a peak pixel intensities occur for the flat end surface and the chamfered surface.

40. (Original) The system of claim 36, wherein the image analysis system is configured to compare at least one of dimensions of the flat end surface and the chamfered surface, peak pixel intensities of the flat end surface and the chamfered surface with reference values, and positions of peak pixel intensities of the flat end surface and the chamfered surface with reference values.

41. (Original) The system of claim 36, wherein the image analysis system is configured to compare a position of a peak pixel intensity of the flat end surface with a position of a peak pixel intensity of the chamfered surface.

42-59. (Canceled)